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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/712,575	11/13/2003	Vijav Narayanan	YOR920030438US1	8789
24299	7590	04/21/2005	EXAMINER	
George Sai-Halasz 145 Fernwood Dr. Greenwich, RI 02818			HU, SHOUXIANG	
			ART UNIT	PAPER NUMBER

2811

DATE MAILED: 04/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/712,575

Applicant(s)

NARAYANAN ET AL.

Examiner

Shouxiang Hu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 February 2005.
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 8, 12, 13, 15-21 and 32-36 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 8, 12, 13, 15-21 and 32-36 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 36 is objected to because of the following informalities and/or defects:

The term of "of claim" recited in claim 36 apparently should read as: --of claim 33--.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8, 12-13, 15-21 and 32-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ngai (6,518,106).

Ngai discloses a semiconductor field effect device (Fig. 5; NMOS; also see col. 2, line 34 through col. 3, line 9), having a gate dielectric (40; SiO₂ or ZrO₂; can be less than 2nm in thickness) and a gate (50), wherein the gate comprises a compound of TaSiN that can have a workfunction of about 4.4 eV, which substantially overlaps with at least the upper portion of the recited workfunction range in the instant invention.

Although Ngai does not expressly disclose that the TaSiN can have an N-to-Ta ratio of greater than about 0.9:1 and/or a Si-to-Ta ratio of between 0.35:1 and 0.5:1, as

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recited in the instant invention, it is noted that, as further evidenced in Nagi (see col. 3, lines 1-10), the compositions of N and Si in the compound and the gate material's workfunction as well are each art-recognized result-oriented parameters of importance subject to routine experimentation and optimizations.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the FET device of Nagi with the N-to-Ta ratio and the Si-to-Ta ratio being about greater than 0.9:1 and between 0.35:1 and 0.5:1, respectively, through routine experimentation and optimization, so that a gate structure have a workfunction of about 4.4 eV or other value with an optimized FET performance would be obtained.

Regarding claim 13, the TaSiN in Ngai is naturally amorphous.

Regarding claims 33-36, it is noted that one of ordinary skill in the art would readily recognize that field effect transistors are widely and commonly used in devices such as digital processors and processors having analog circuits for achieving high performance and low power consumption in these devices.

Regarding claim 36, it is further noted that the resistivity of the TaSiN compound in the above optimized device would be naturally below about $20\text{m}\Omega\text{cm}$ as the one recited in the instant invention, since the compound in it would have a substantially same gate structure and material set as the one of the instant invention. Besides, low resistivity for the gate material is always desirable, and it would be well within the ordinary skill in the art to achieve such low resistivity through routine experimentation and optimization.

Response to Arguments

3. Applicant's arguments filed on 02-04-2005 have been fully considered but they are not persuasive.

In respect to applicant's main arguments that Nago does not teach the workfunction can be below 4.4 eV, it is noted that the recited workfunction in the claimed invention, i.e., "between about 4.31 eV and 4.4 eV", does not necessarily have to be interpreted to be below 4.4 eV. Instead, it can be interpreted as covering a workfunction that can be about 4.4 eV, which is clearly overlapped by what is disclosed in Nago.

In addition, with respect to the arguments regarding the recited ratios, it is noted that composition ratios and the gate material's workfunction are each art-recognized result-oriented parameters of importance subject to routine experimentation and optimizations. It would be well within the ordinary skill in the art to reach the recited composition ratios for obtaining the workfunction of about 4.4 eV (or other desirable values) through routine experimentation and optimization.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

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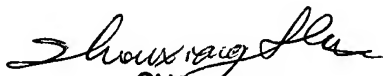
mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-1654. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SH
April 14, 2005


SHOUXIANG HU
PRIMARY EXAMINER